MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 2, 2017/2018

PPC0116 – PRE-CALCULUS

(All Sections / Groups)

5 MARCH 2018
9.00 a.m. – 11.00 a.m.
(2 Hours)

INSTRUCTIONS TO STUDENTS

1. This examination paper consists of **4 printed pages** (including the cover page) with **4 questions only.**

2. Each question is worth **25 marks. Attempt ALL questions.**

3. Please write all your answers in the Answer Booklet provided. **Show all relevant steps** to obtain maximum marks.

Question 1 (25 marks)

(a) If $z = 1 + 2i$ and $w = -2 - 3i$ are the complex numbers, write each of the following expression in standard form (a + bi):

(i) $z^2 + w^2$

[2 marks]

(ii) $\frac{z}{w}$

[2 marks]

(iii) $(z - w)^2$

[2 marks]

(b) Solve the following equations and inequality:

(i) $1 + \sqrt{2x+3} = 3 + \sqrt{x+2}$

[5 marks]

(ii) $x^{-\frac{2}{3}} + 2x^{-\frac{1}{3}} - 3 = 0$

[4 marks]

(iii) $\frac{1}{x+1} \geq 1 - \frac{1}{3x-1}$

[5 marks]

(c) A company is going to make circular frames as part of a new product they are launching. The circular frame, as shown in Figure Q1, will be cut out of a piece of steel. The inside of the circular frame has a radius of 6 cm.

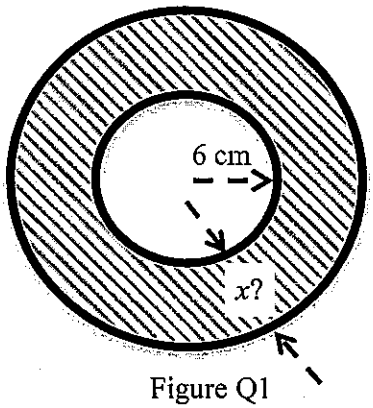

Figure Q1

(i) What is the width x of the frame if the total inner and outer perimeter of the circular frame is to be 26π cm?

[2 marks]

(ii) If the thickness of the circular frame is 4 cm, and it must maintain a volume of 112π cm^3, what should the width x of the frame be?

[3 marks]

Continued....

Question 2 (25 marks)

(a) Determine the equation of the line that passes through the point (−1, 5) and is parallel to the line given by $10y+3x+15=0$

[5 marks]

(b) Given $f(x)=x^2(x^2-3x-4)$,

(i) Find the x-intercept(s) and y- intercept(s) of the graph of f, if any.

[2 marks]

(ii) State whether the graph of f crosses or touches the x-axis at the x-intercept(s).

[2 marks]

(iii) Determine the end behaviour of the graph of f.

[1 mark]

(iv) Determine the maximum number of turning points on the graph of f.

[1 mark]

(v) Determine the behaviour of the graph of f near each x-intercept.

[3 marks]

(vi) Sketch the graph of f.

[3 marks]

(c) Solve the following equations:

(i) $5^{x-2}=3^{3x+2}$

[3 marks]

(ii) $\log_{10} x+\log_{10}(x-2)=\log_{10}(6-x)$

[2 marks]

(iii) $4^x=2^x+12$

[3 marks]

Question 3 (25 marks)

(a) Use long division method to perform the division for the following polynomial equation to find the quotient and remainder.

$$f(x)=\frac{x^2(3x^2-1)}{1+x^2(x-1)}$$

[6 marks]

(b) Use the Factor Theorem to show whether the followings are the factors of

$$f(x)=2x^3-x^2+2x-3$$

(i) $x-1$

[2 marks]

(ii) $x+3$

[2 marks]

(iii) $2x+2$

[2 marks]

Continued....

(c) Given a function $f(x)=2x^5+5x^4-2x^3+2x^2-2x+3$, use synthesis division method to find the remainder if it is divided by $x+3$. Use the Remainder Theorem to verify your answer.

[5 marks]

(d) Given the rational function

$$f(x)=\frac{x^3-3x-1}{x^2-x-2}$$

Use partial fraction decomposition to show that it can be written in the form

$$f(x)=Ax+B+\frac{C}{(x+D)}+\frac{E}{(x+F)}$$

by determining A,B,C,D,E and F.

[8 marks]

Question 4 (25 marks)

(a) The first three terms of a geometric sequence are given as $2x + 8$, $2x$ and $4x - 30$, where x is a positive integer.

(i) Find the possible value of x, the corresponding first terms, a and common ratios, r.

[7 marks]

(ii) Find the sum to infinity for this series.

[3 marks]

(b) An arithmetic sequence has first term $\log_2 27$ and common difference $\log_2 X$.

(i) Show that the fourth term can be written as $\log_2 (27X^{-3})$.

[3 marks]

(ii) Given the fourth term is 6, find the exact value of X and then determine the sum of first fourth term in this sequence.

[6 marks]

(c) (i) Find the first 4 terms of the binomial expansion, in ascending powers of x, of $(1-x)^{12}$.

[4 marks]

(ii) Using the binomial expansion in (c)(i), find the approximate value of $(0.999)^{12}$. Give your answer to 4 decimal places.

[2 marks]

End of Paper